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Section I

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Do We Need Calendar Reform?

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Editorial Department Note

The current Official Publication is issued in the interest of calendar reform—a movement in favor of which the National Association of Cost Accountants has gone on record. Dr. S. C. McLeod, in writing a foreword for a booklet entitled "Do We Need Calendar Reform," and published by Mr. George Eastman, President of the Eastman Kodak Company, says: "At a meeting of the Board of Directors of the National Association of Cost Accountants held on Thursday, April 21, 1927, the question of Calendar Reform was considered. Every member of the Board present expressed himself individually as being in favor of the proposed reform of the calendar into thirteen months, and a resolution to this effect was adopted. Our Board is strongly in favor of this movement. We would be glad of the opportunity to contribute toward its accomplishment, but we believe that it ought to be organized on the broadest possible basis and in such a way as to remove any possibility of its being exploited by any individual for his personal profit."

This publication, which is in the main a reprint of the above booklet, except for the omission of several charts, is made possible through the courtesy of Mr. Eastman, whose interest in the elimination of Calendar Waste, is indicative of his interest in everything which makes for the better and more scientific conduct of modern business.

DO WE NEED CALENDAR REFORM?

Purpose of a Calendar

The purpose of a calendar is to measure and register the passage of days throughout each year, and to arrange in advance what dates shall be Sundays, workdays and holidays. Neither the length of the year nor that of the day of 24 hours can be altered, as these units are astronomically fixed.

Both the month and the week are arbitrarily fixed units used for measuring intermediate periods between the day and the year. They are not divisions of time indicated by the sun, moon or stars. Their usefulness and convenience would be increased if the month were an exact multiple of the week, and if the year were as exact a multiple of both the week and the month as nature permits.

In the present calendar, the day and the week are invariable and the year practically so, but the months are neither equal nor uniform. This variation in an important unit of the calendar has widespread effects.

Origin of the Gregorian Calendar

The Gregorian calendar had its origin in the calendar devised by the Egyptians. The Egyptian calendar was developed through years of study of the length and direction of the noonday shadows cast by the pyramids, which it is now thought were built for that purpose. As the land in Egypt capable of cultivation was limited

to the delta area of the Nile and the two narrow strips on the bank which were inundated annually, the ancient Egyptians were forced to increase their crops by intensive cultivation. This could only be done by locating and using the precise seasons required in raising the various crops. The range of the seasonal sunrise point from farthest north to farthest south is so narrow in Egypt that the use of this method for determining the seasons gave inaccurate results.

The seasons could best be determined by measuring the length of the shadows cast by the sun at noon. At first the shadow cast by an obelisk was used, but to give a longer shadow a pyramid was built. The pyramids were built higher and higher in order to give longer shadows and to give a more perfect slope, until finally the Gizeh Pyramids near Cairo were built. These pyramids were used by the Egyptian astronomers in devising their calendar and their astronomy, which was the beginning of the present astronomy. The pyramids were used as tombs for the Pharaohs only after each pyramid had been superseded by a more perfectly sloped or higher one. The Great Pyramid has a height of 480 feet, and there is a difference of about four feet in the length of the noonday shadow on two consecutive days near the Equinox.

The Egyptians determined the true length of the year—365.242 days—and divided it into 12 months of 30 days each. The 5 extra days (or 6 extra days in Leap Years) were devoted to festival holidays. The month was divided into three 10-day periods.

After the conquest of Egypt, Julius Caesar, in 46 B.C., adopted the Egyptian calendar for the Roman Empire, except that he did not continue the equal months of the Egyptians. He distributed the 5 extra days throughout the year by adding one day to every other month, i. e., January, March, May, July, September and November "because odd numbers were lucky," and took one day off February.

In 28 B.C., Augustus Caesar, in order to have as many days in the month of his birth (August) as there were in the birth month of Julius Caesar (July), and also to be known in history as having altered the calendar, moved the 29th day of February to August. Property owners who rented by the quarter objected to the unequal quarters caused by this change, as there would have been 90 days in the first quarter and 93 in the third. Augustus compromised by moving September 31st to October 31st. That caused two 31-day months to come together, and a further change was made by moving November 31st to December 31st.

The Julian calendar was based upon a 365.25-day year, with a Leap Year every fourth year. As the actual year is 365.242 days, .008 of a day was accumulated every year. By 1582 the accumulation had amounted to 10 days, and Pope Gregory in that year ordered the 10 days between October 5th and October 15th dropped

from the calendar, and adopted the present rule for Leap Year. The Gregorian calendar was not adopted by England and her colonies until 1752.

The Mosaic 7-day week of the Hebrews was made legal by Constantine the Great in 321 A.D. when he embraced Christianity. However, the first day of the week, Sunday, was then the day of rest and worship with the Christians, whereas Saturday was the Sabbath with the Jews. Until that date, Romans used 8-day weeks without any designated rest-days.

The Gregorian calendar is now used by the western hemisphere, Europe and Japan. The Greek and Orthodox Churches and Russia have recently changed from the Julian calendar to the Gregorian.

The Moon calendar is still largely used in China, although the Gregorian was adopted by the leaders of the Republic in 1912 and is now used for government, legal, and other national purposes. The Asiatic, African, and Mohammedan calendars are based on lunar months.

Defects of Present Calendar

There are three principal defects in the Gregorian calendar:

1. Three divisions of the year—the months, the quarters and the half-years—are of unequal length. The month varies from 28 days to 31 days; the quarter varies from 90 to 92 days; and the half year may vary from 181 to 184 days.

2. The month is not a multiple of the week. With the exception of February, each month contains 4 weeks plus two or three days, which causes the day-names and dates to change incessantly in the different months.

3. The calendar is not fixed; it changes each year. As the ordinary year has one day over fifty-two weeks, the date of the month falls each year on a different day of the week from the preceding year.

As a result of these three defects, unnecessary inconvenience, difficulties and confusion are caused to men and women in all walks of life.

The unequal length of months, quarters and half-years is a cause of confusion and uncertainty in economic relations and in the arrangement of all statistics and accounts. Due to the variation in the month, which may contain 28, 29, 30 or 31 days, all calculations of salaries, interest, insurance, pensions, leases and rents, which are fixed on a monthly, quarterly or half-yearly basis are inaccurate and do not correspond with one-twelfth, one-quarter or one-half of the year.

The variation in the lengths of the months causes much difficulty to business. There is a difference of 11% between the length of February and the length of March. There is even a greater difference between the number of working days, which is the im-

NUMBER OF WORKING DAYS IN EACH MONTH OF 1926-27

(Allowance made for Saturday half-holiday and 7 holidays)

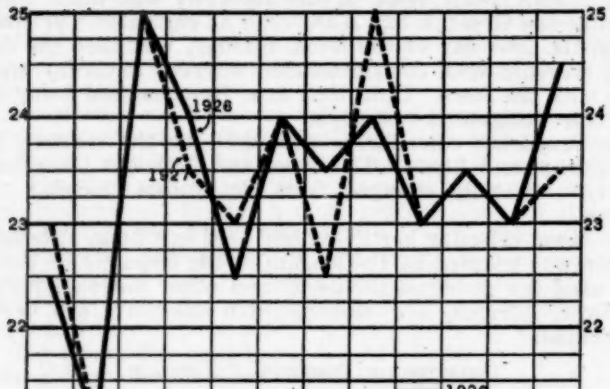

CHART No. 1

NUMBER OF SATURDAYS IN EACH MONTH OF 1926

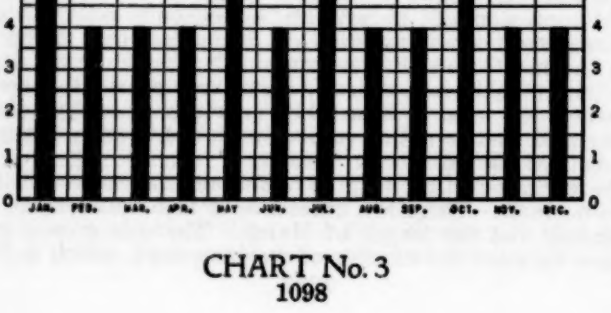

CHART No. 3

portant factor in all business. Chart No. 1 shows the number of working days in each month of 1926 and 1927, allowance having been made for Sundays, holidays and Saturday half-holidays. There is a variation from 21 working days in February to 25 in March, or a difference of 19%. It is expensive to make adjustments for these variations but unless adjustments are made, monthly comparisons are misleading. Interest calculations are especially complicated by the unequal length of the months.

Chart No. 2 shows how the day-names and dates in the different months of the present calendar are scattered over the ever-changing range of five full weeks, with three months of 1926 running into six weeks. This variation is caused by the fact that the month is not an exact multiple of the week. In any system of weights and measures, every unit is an exact multiple of its lower unit—the pound contains exactly 16 ounces, the yard exactly 3 feet, etc. Chart No. 3 shows the number of weeks per month during 1926.

This variation in the make-up of the different months of the same year and of corresponding months in different years causes a great number of difficulties. Some of these will be indicated:

1. It is necessary to renew and print millions of new calendars annually.

2. Workdays, rest days and week-ends are unequal in consecutive months and in corresponding months of different years.

3. The variation in the number of paydays during the month causes confusion to the manufacturer in compiling his monthly cost reports and expensive adjustments are necessary.

4. Since the various days of the week are not of the same value as regards the volume of trade, there can be no accurate monthly comparison between one year and another since the months do not, from year to year, include the same number of individual week-days. This is especially true in those lines of business in which week-end operations are heavy, such as department stores, railroads, newspapers.

5. The variation in the number of weeks in the month causes confusion to those small stores that make collections on a weekly basis and pay on a monthly basis, and corresponding confusion for those families whose income is on a monthly basis and whose expenses are on a weekly basis.

6. The variation complicates the otherwise simple reckoning of days, dates and the passage of time generally.

This variation in the number of individual week-days in the month upsets comparisons in various lines of business. It is obvious that if adjustments were not made for these variations, all the monthly reports would be misleading.

Data representing many natural phenomena like precipitation, the flow of rivers which are of great importance in many power and engineering projects, the spottedness of the sun, intensity of

PRESENT CALENDAR, YEAR 1926

MO.	1st WEEK	2nd WEEK	3rd WEEK	4th WEEK	5th WEEK	6th WEEK	MO.	SATURDAYS
	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M		
JAN.	1 2	3 4 5 6 7 8 9	10 11 12 13 14 15 16	17 18 19 20 21 22 23	24 25 26 27 28 29 30	31	JAN.	5
FEB.	1 2 3 4 5 6	7 8 9 10 11 12 13	14 15 16 17 18 19 20	21 22 23 24 25 26 27	28		FEB.	
MAR.	1 2 3 4 5 6	7 8 9 10 11 12 13	14 15 16 17 18 19 20	21 22 23 24 25 26 27	28 29 30 31		MAR.	
APR.	1 2 3	4 5 6 7 8 9 10	11 12 13 14 15 16 17	18 19 20 21 22 23 24	25 26 27 28 29 30		APR.	
MAY	1	2 3 4 5 6 7 8	9 10 11 12 13 14 15	16 17 18 19 20 21 22	23 24 25 26 27 28 29	30 31	MAY	5
JUN.	1 2 3 4 5	6 7 8 9 10 11 12	13 14 15 16 17 18 19	20 21 22 23 24 25 26	27 28 29 30		JUN.	
JUL.	1 2 3	4 5 6 7 8 9 10	11 12 13 14 15 16 17	18 19 20 21 22 23 24	25 26 27 28 29 30 31		JUL.	5
AUG.	1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21	22 23 24 25 26 27 28	29 30 31		AUG.	
SEP.	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18	19 20 21 22 23 24 25	26 27 28 29 30		SEP.	
OCT.	1 2	3 4 5 6 7 8 9	10 11 12 13 14 15 16	17 18 19 20 21 22 23	24 25 26 27 28 29 30	31	OCT.	5
NOV.	1 2 3 4 5 6	7 8 9 10 11 12 13	14 15 16 17 18 19 20	21 22 23 24 25 26 27	28 29 30		NOV.	
DEC.	1 2 3 4	5 6 7 8 9 10 11	12 13 14 15 16 17 18	19 20 21 22 23 24 25	26 27 28 29 30 31		DEC.	

CHART No. 2

solar radiation, including records of vital statistics and economic progress, are almost without exception summarized in the present system of unequal months or seasons. The artificial fluctuations caused by these calendar inequalities upset the conclusions sometimes drawn from the intercomparison of such statistics. On the other hand, much time and labor is expended if adjustments are made in advance, but even this is often quite impossible and without corrections the results attained are necessarily inaccurate.

Because the date of the month falls each year on a different day of the week from the one on which it fell the preceding year, dates of periodical events can never be fixed with precision in advance. Complications arise especially in setting regular dates for meetings and providing for holidays that fall on Sunday. Confusion arises because the holidays occur on different days of the week in different years. If a holiday occurs in the middle of the week it is quite expensive for certain industrial plants to shut down at that time.

In A. D. 325 the Council of the Christian Churches at Nicaea adopted the present rule for determining the date of Easter, which is that Easter shall be on the first Sunday following the full moon which happens upon or next after the 21st of March. The principal reason for placing Easter Sunday on this date was that the pilgrims needed moonlight to travel on their way to the great yearly Easter festivities.

The date of Easter may vary at present between March 22 and April 25, i. e., over a period of 35 days. Numerous disadvantages result, both from a civil and a religious point of view. The present calendar causes church years to be of varying length in those churches which base their year from Easter to Easter, and Easter often comes in an unseasonable part of the year. There is a further disadvantage due to the fact that the number of Sundays of the year being practically fixed, services of the liturgy of certain churches which cannot take place before Easter, when Easter is early, have to be postponed. Practically all Christian churches are agreed that the fixed Easter would be desirable.

The shifting Easter causes confusion in schools and universities in regulating their semesters. The chief disruption occurs, however, in connection with certain commercial lines of business, such as concerns dealing in textiles and articles of fashion, since Easter has long been looked upon as the beginning of spring fashions. If Easter is early, on account of the cool weather prevailing in the greater part of the Northern Hemisphere, changes in dress are postponed and the clothing and ready-to-wear industries suffer accordingly. Early Easters often cut down the volume of Easter retail trading and sometimes bring unemployment in the clothing, ready-to-wear and shoe industries. If, on the other hand, Easter is late, the textile trade in spring wear may be injured because summer articles are purchased at once. The usual Easter

vacations cause increased travel and the changing date of Easter sometimes disturbs the transportation industry.

The effect of the "wandering" Easter is noticed much more in South and Central America and in Europe than in the United States, because Easter is looked upon as a more important date in the calendar in these countries.

Progress of Movement to Reform the Calendar

When consideration is given to the fact that the purpose of the calendar is to measure time and that one of the most important units of the present calendar, i. e., the month, is not uniform as to the number of week-days contained in it, the question naturally arises as to whether the present calendar cannot be changed, especially in view of all the confusion which this and other defects in the present calendar bring to the everyday life of the people. The original or Egyptian calendar was not based upon any well-thought-out plan that gave equal units of time in division of the year. This calendar was further altered by the capricious whims of the Caesars, and later in 1582 was corrected as far as possible under the existing plan by Pope Gregory giving us what we still have today as the Gregorian calendar.

Conditions have changed greatly since that time. The business of the world is conducted on an entirely different basis than prevailed almost two thousand years ago. Business men are becoming more and more dependent upon accounting and statistical records for the proper conduct of their affairs. All other factors and auxiliaries of business, such as mediums of exchange and currencies, commercial laws, banking and credit systems, standardization of time, labor-saving machinery, production methods, and transportation methods have been changed and are constantly being changed to conform to the demand of modern business. It is logical to inquire as to whether the calendar cannot be changed in order to conform more nearly to modern needs.

Business men are not the only ones who are adversely affected by the defects in the present calendar. Records and comparisons are equally as important to scientists and investigators in the various fields of endeavor. It is just as important that the bases of these records should be uniform and accurate as for business records.

For many years men in different countries have recognized the disadvantages of a multiplicity of calendars and the various imperfections of all calendars, and also the inconvenience of the ever-changing date for religious festivals such as Easter. Many suggestions have been made to remedy some or all of these faults, and a great impetus was given to the movement in 1922, when a Committee of Enquiry to study and report upon the question was appointed by the League of Nations.

The one outstanding man who has been most active and influential in the study of a reform in the calendar is Moses B.

Cotsworth. Mr. Cotsworth was born near York, England, in 1859. Upon graduation from school he entered the employment of the Northeastern Railway, working in the office of the Chief Traffic Manager. Mr. Cotsworth later became a special investigator and adviser to the General Management of the Railway Company, and it was his duty among others to explain increases and decreases in the net earnings of the company each month. Mr. Cotsworth found great difficulty in making adjustments for the irregular number of days in the month. The variation in the number of weekdays in the month had a particularly great effect upon the railway business because of the light freight traffic handled over week-ends. The great amount of time which Mr. Cotsworth had to devote to eliminating these variations caused by defects in the calendar led him into a study of the origin and development of the Gregorian calendar, and in fact, the study of the development of calendars from the beginning of history. From 1888 to date Mr. Cotsworth has devoted considerable time to the study of calendars, and the effect which the Gregorian calendar, with its variations, has upon all lines of business, churches, schools and people in general.

After several years of research into the evolution of the calendar systems of current and ancient civilization, Mr. Cotsworth printed in 1902 a 540-page book entitled *The Rational Almanac* dealing with calendar reform. In 1909 at the request of Sir Sandford Fleming (the originator of standard time), Mr. Cotsworth read a paper on "The Need of a Rational Almanac" before the Royal Society of Canada. This Society, after careful investigation, unanimously endorsed the Cotsworth Proposal for Calendar Reform. His plan provided for thirteen months of twenty-eight days each with every month the same. The 365th day would be taken care of by inserting a day, December 29th, between Saturday, December 28th and Sunday, January 1st.

In 1914 a meeting of the International Chamber of Commerce was called to meet at Belgium to consider plans to revise the calendar. At this meeting it was decided to call a meeting of representatives of the various nations at an international conference which was expected to be held in the fall of 1914. The World War caused an indefinite postponement of this meeting.

Unaware of the work which Mr. Cotsworth had done in the study of calendars, the Liberty Calendar Association was formed in 1918 to advocate the adoption of a 28-day month. At a meeting in 1922 at Washington at which the various forms of calendar reform were discussed, Mr. Cotsworth convinced the Liberty Calendar Association that his plan was preferable to their plan and they unanimously endorsed the Cotsworth calendar.

During the past few years Mr. Cotsworth has devoted his entire time in an effort to interest men in all fields of endeavor toward a study of calendar reform and the endorsement of his plan. The movement covered various countries and progressed to the point where the League of Nations appointed a special Com-

mittee of Enquiry. The Committee consisted of the Chairman, Prof. van Eysinga, of Holland; a member of the League of Nations; a representative of the Roman Catholic Church; a representative of the Greek, Russian and other Orthodox Churches, and a representative of the English Church; a representative of the International Union of Astronomers, and a representative of the International Chamber of Commerce. The purpose, the work and the findings of the Committee are available in their report published in 1926. While the Committee recognizes and points out the difficulties of such a reform, it also points out the great advantages to be gained and expresses itself as favoring the movement.

The International Fixed Calendar

Of all the plans submitted to the League of Nations' Committee the "International Fixed Calendar" devised by Moses B. Cotsworth seems to be the one outstanding proposal which meets the needs of business and other interests and has the largest number of supporters. This calendar consists of thirteen standard months as follows:

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Each month of the year will always be exactly the same as that shown above. The new month will be inserted between June and July, as at that time of the year the change will cause the least confusion with respect to the seasons and make for the least average displacement of familiar dates. The 365th day will be December 29th, and will have no week-day name. This day, to be known as "Year-day," will be inserted between Saturday, December 28th, and Sunday, January 1st. In like manner in Leap Year the extra day will be June 29th, placed between Saturday, June 28th, and Sunday, the first day of the new month.

All the defects which have been listed above as obtaining under the present calendar can be overcome by the Cotsworth plan. This proposed calendar would therefore have the following advantages over the present calendar:

1. All months would be equal, having exactly the same recurring twenty-eight week-days.
2. The day of the week would always indicate the monthly date, and conversely, the monthly date would indicate its

week-day name. Both day and date could be recorded on clock and watch dials.

CLOCKS AND WATCHES COULD BE MADE INTO COMPLETE TIME AND CALENDAR RECORDERS THUS:—

EVERY MONTH WILL CYCLE THROUGH ITS 28 DAYS, TICKED OFF BY THE "DAY-POINTER"

3. The complete four weeks would exactly quarter all months, harmonizing weekly wages and expenses with monthly rent, accounts, etc.
4. Pay-days would recur on the same monthly date which would facilitate both business and home life.
5. Each week-day would recur on its four fixed monthly dates, thereby making more regular the weekly and monthly work, payments, production, etc.
6. All periods for earning and spending would be either equal to or exact multiples of each other.
7. Holidays and other permanent monthly dates would always occur on the same week-day.
8. Every month-end would coincide with the week-end. Fractions of weeks at month-ends would cease.
9. The month of exactly four weeks would obviate many of the adjustments now necessary between four and five-week months. All months would be comparable without any adjustments being made for unequal days or unequal number of weeks. A great amount of clerical work would be eliminated in the preparation of accounting and statistical reports in government, business, scientific, health and home affairs.
10. The reckoning of lapse of time for interest and other purposes would be greatly simplified; e. g., 1st month, 10th,

to 6th month, 20th; as 28x5 = 140, plus 10, would be 150 days.

11. All holidays could be placed on Monday with advantage both for industry and for workers.
12. Easter could be fixed, which would be of benefit to churches, to certain industries, and to schools.
13. As there would be thirteen monthly settlements during the month instead of twelve, there would be a faster turnover in money; the same volume of business could be handled with less money. This would result in considerable saving throughout the country as a whole. See Table No. 13, which shows the saving which one large British firm has estimated it would obtain from this faster turnover.
14. There would be a saving of money in printing calendars, and of time in referring to calendars.
15. For women, the 28-day lunar month is Nature's regulating unit, which constantly times their physical periods of 28-days, and the 280-days of developing motherhood. Half of humanity is composed of women, everyone of whom will be greatly benefited by the 28-days per month calendar in their personal reckonings of exactly one month and 10 months.
16. Special attention is called to the advantages to industry if all holidays are placed on Monday. Great saving will be effected by having a holiday on Monday instead of the middle of the week. There is even a greater advantage to labor to have this arrangement that gives the worker two or three free days together whenever holidays occur.

The Cotsworth Thirteen-Month Calendar has the following disadvantages:

1. The figure thirteen is not divisible by 2, 3, 4 or 6.
2. The quarters of the year do not contain a whole number of months.
3. There would be 13 monthly closings, reports and statements instead of 12, with 1 blank day.
4. The introduction of a year of 13 months requires a change in established customs.

Commenting on these disadvantages, it may be said that it is not necessary to divide the year by three or six; thus the first two objections resolve into the one objection that the end of quarters and half-years do not coincide with month-ends. Under the proposed calendar, the quarters and half-years would end with the week. In this country and most other countries, the number of quarterly transactions is relatively very small when compared with the number of monthly transactions.

There would be additional clerical work necessary in preparing thirteen monthly statements instead of twelve, but the great

SAVING DUE TO FASTER TURNOVER OF MONEY
ESTIMATE OF TYPICAL COMPANY

As an indication of the comparative amounts which the establishment of 28-day-months would release from the monthly circulations of business Liquid Assets, during January, February and March of the first new Calendar-year, the following duly certified estimate was made by their Chief Accountant for the Directors of an eminent and typical English Company.

(Copy with Pounds converted into Dollars for international example).

15th October, 1924.

"A"	The increased efficiency of capital, due to its more rapid circulation, would cause a reduction in our circulating assets of at least....	$150,000	Initial Capital Saving.
	This amount would immediately become available either for the purpose of further extensions of our business or for outside investments, and represents an annual saving, reckoning interest at 5 per cent. of.....	$7,500	Yearly.
"B"	In addition to this, there would be an annual saving in Interest, due to the earlier collection of debts from customers, of approximately..	2,010	Yearly.
	making a *Total Gross Annual Saving of*....	$9,510	Yearly Saving.
"C"	*Less—Cost of rendering* 13*th month's Statements, viz*: Postage .....$35 Stationery..... 15	100=1	*per cent. of the above definitely calculable Yearly Saving of* $9,510.
	Making a Total Net Annual Saving of.....	$9,410	

These figures have been arrived at as under:

Quarterly and Half-Yearly payments I have assumed would be made at the end of 13 and 26 weeks respectively:—

"A" *CAPITAL SAVING.*

Sundry Debtors.....Present monthly average

Less Sundry Creditors.....Present monthly average

Add Bank and Cash, normally, say: $250,000

Less Wages Portion..... 100,000 Divided by 13= $138,655

13)$150,000 13)$1,802,250 Difference.

$11,540 11,540 $150,195 Total

"B" INTEREST SAVING DUE TO EARLIER COLLECTION OF CUSTOMERS' ACCOUNTS, ETC.

Annual "net" Sales .....

Less Payments to Sundry Creditors.....

Balance..... $5,875,000

2½ days' Interest at 5 per cent. per annum on..... $5,875,000=$2,010 Total.

Representing:—

Profit.
Weekly Wages this month.
Stamps.
Depreciation Charges
Rates.
Gas and Electricity.
Water
Rents.
Interest and Bank Commission
Insurance.
Pension Fund Contribution.

} Quarterly, Half-Yearly and Yearly Payments.

The above are only the readily calculable savings to our own business, but I feel sure that the universal adoption of the 4-weeks-calendar would bring very large incalculable ones to mankind generally.

Wishing you every success, Believe me, Yours faithfully,

(Signed by) CHIEF ACCOUNTANT.

TABLE No. 13

saving due to the elimination of the various adjustments now necessary on account of the variable months would more than offset this additional work. This has been the experience of concerns who use a thirteen-period year for their accounting records.

Regarding the fourth objection, any calendar change would involve a change in customs and a change would be desirable only if the advantages which have been enumerated above outweighed the disadvantages.

The So-called French Plan

Under the second proposal to which the League of Nations Committee called attention, the year would be divided into twelve months with each quarter containing exactly thirteen weeks. In common years one such quarter and in Leap Year two quarters would have months with 30, 31, and 31 days; the other quarters would consist of 30, 30 and 31-day months. The year would begin with New Year's day, as January "0," preceding January 1st.

The advantages of this plan are that the half-years and quarters have a whole number of months and weeks. As the 31st day could be Sunday, most of the months would have the same number of working days. A calendar of this type would not involve as many changes in the habits and customs of the people as a thirteen-month calendar.

On the other hand this type of calendar would have only a slight advantage over the present calendar and would not bring nearly so many advantages as the thirteen-month calendar. Among the disadvantages of this plan are: (1) The months are not of the same length. (2) The months do not contain a complete number of weeks. (3) The dates do not fall on the same day of the week in each month. This proposed plan would not correct the greatest defect of the present calendar which is that the unequal months cannot contain exactly four weeks.

The International Fixed Calendar and the French Plan Compared

There would be comparatively little gain to the business world in the adoption of the 30, 30, 31-day plan except to those industries where quarterly transactions are more important than monthly transactions. All monthly comparisions would still be upset because of the unequal number of weeks in the month. The week would not coincide with the month, and week-days would occur on different dates of the month.

It is evident that the French Plan would bring very little benefit to business as compared with the present calendar. The month would not have four fixed weeks; some months would have four Saturdays and some months five Saturdays. The manufacturer would still be troubled with the varying number of pay-days in the month which would upset his burden and cost reports. Ac-

curate comparisons could not be made between different months of the same year because of this varying number of week-days within the month, with each week-day having, in many lines of business, a different value. The same month of different years could be compared without adjustment, which is practically the only advantage the French Plan has over the present calendar.

It is apparent that the International Fixed Calendar would be very much simpler. Any month could be compared with any other month without any adjustment being necessary, and each month would contain the same number of week-days year in and year out.

One of the advantages claimed for the French Plan is that the quarters would contain three months whereas in the International Fixed Calendar the quarter would contain three months and one week, and the half-year would contain six months and two weeks. The number of quarterly transactions is very small as compared with the number of monthly transactions and hence the number of quarterly records which it is necessary to keep would be much smaller than the number of monthly records. It has been estimated that there are 3,700 times more monthly accountings than quarterly ones. There would be an advantage under the International Fixed Calendar as far as quarterly and semiannual reports are concerned, in that these reports could be compiled during the month and not at the end of the month when they would coincide with the monthly reports.

It is evident that as far as business is concerned, the French Plan would offer very few advantages over the present calendar, whereas the proposed calendar would offer a great many advantages to business and hence to the world at large.

Present Use of Thirteen-Period Calendars

As indicated in the League of Nations' report, one of the best indications of the value of the thirteen-period calendar to business, is the present use of such calendars by many business concerns. The following concerns comprise a few of the companies which are already using the thirteen-period calendar: Graton & Knight Mfg. Co., Worcester, Mass.; Fuller Brush Co., Hartford, Conn.; Loew's Inc., New York City; C. G. Conn, Ltd., Elkhart, Ind.; Hickok Mfg. Co., Inc., Rochester, N. Y.; Lukens Steel Co., Coatesville, Pa.

Science Needs the Thirteen-Month Calendar

(By Dr. C. F. Marvin, Chief of U. S. Weather Bureau)

Statistical analysis is that branch of science which enables the trained student to impersonally investigate and disclose the complex and obscure relationships between thousands and even hundreds of thousands of fluctuating values which are influenced by numerous causes producing changes. Whenever time is one of the variable elements, as in the case of solar and meteorological

observations, crop production, health statistics and the incipiency of many diseases, the calendar used in summarizing the data is of great importance.

Only a little more than 25 years have elapsed since the science of statistics has been put upon a beautiful and exact analytical basis by the contributions of a long list of eminent mathematicians, such as Charlier, Thiele, Pearson, Yule and others. Armed with the powerful tools of analysis and research thus supplied, a student is discouraged at the outset to find that the data he must use has already been summarized by the present calendar in unequal monthly and seasonal units. Here at the outset of his research is a false or artificial cause of fluctuations which he must allow to mar his conclusions, or a very great task must be undertaken to recompile new summaries from the original observations.

The inequality of its months is by no means the greatest fault of the Gregorian calendar. The month is quite too long a unit for many civil, social and scientific purposes. The week and the fortnight are both necessary smaller units, but for statistical research they must both be aliquot parts of the month, the season and the year, as well as stand in simple multiple relations to each other. No 12-month calendar of any kind can possibly satisfy all the above prerequisites. The International Fixed Calendar, however, does satisfy all these statistical prerequisites in a very complete manner. In fact, these statistical exactions are just the things which guided Mr. Cotsworth in his reform of the present calendar.

A few examples will help to force home the importance of the statements made above.

Fully ten years ago the increased length of many records then available made it opportune and desirable for the United States Weather Bureau to compute new values of the daily normals of maximum, minimum and mean temperature at many stations. At that time the 13-month calendar was almost unheard of in public circles. The problem of the normals from 50 years of daily observations at more than 150 stations is a question of the scientific analysis of over five million individual temperature readings. All of these had been summarized in unequal monthly groups of the Gregorian calendar. The worst part of it was that the months were not only unequal but were too long a unit to satisfy the statistical standards such a great problem demanded. Here was a dilemma with two horns. Either a great piece of work must be poorly done because of a bad 12-month calendar, or much time and labor must be expended in a *de novo* computation from the original observations of new averages on a standard schedule of 52 weeks to the year.

Notwithstanding the great additional labor it entailed, the computations were all carried out on the weekly basis, and the present temperature normals of the United States Weather Bureau are not free from the technical errors due to the unscientific calendar we continue to use.

Meteorology can supply many instances where the incommensurate relations between the present time units is wasteful of time or productive of crude and unscientific results. Forty years ago the Weather Bureau began the publication of weekly summaries of weather conditions for agriculture. This schedule of weeks must be shifted one day in advance each year and two days in leap year in order to keep in step with the civil calendar. Not only is needless work required to make the necessary adjustment, but the relations of the week to the solar and astronomical causes, which control the weather, change with each adjustment and impair the comparability of weeks in different years which seem to correspond but really do not.

The mysterious cycle of sunspots is a subject of constant statistical investigation by scientists. What sound conclusions can be drawn from tables of sunspot numbers, areas, etc., when February with only 28 days is sandwiched between January and March with 31 days each, as if all were of equal length?

The science of exact statistics is relatively young, having been put upon a substantial mathematical basis well within the last half-century. Wherever time is a variable element the calendar must give days, weeks, fortnights, months and seasons all in as simple aliquot and multiple relations as possible. The 13-month calendar does this and no other arrangement can. The increasing demands to meet statistical requirements is one of the most weighty reasons for calendar reform.

To those whose daily work brings them face to face with the faults of the present calendar, it seems that only habitual use of it by those who are unconscious of the needless waste it entails can explain how anyone can advocate its perpetuation. On the other hand, only lack of acquaintance with the simple elegance of the 13-month plan, and the scientific and civil benefits that will accrue to all humanity by its adoption, will cause anyone to oppose this reform.

Difficulties Involved in Making a Calendar Change

A change in the calendar would not involve a loss in investment as there is practically nothing invested in calendars beyond the current year. On the other hand, there would be a distinct saving in that it would not be necessary to reprint calendars every year.

Many of the Church organizations have already stated that they would offer no objections to the proposed change in the calendar, and all of the Christian Churches favor the fixing of Easter.

There is no objection from the point of view of the astronomer to the International Fixed Calendar because it does not change the length of the day or the year. The month is not an astronomically fixed unit of time.

Any calendar change would cause a certain amount of incon-

Plan "C" shows the 13 Months "INTERNATIONAL FIXED CALENDAR," with its Fixed week-day-names in the left column, for the proposed 28-dates repeating every month. Present dates are down the "G" side of each month's column, with the international-dates down each month's right column I.

The + and − figures under each month's name show the numbers of days the International Calendar would advance or recede each present month's dates

WEEK-DAYS Never Changed	1 JAN. Same		2 FEB. +3		3 MAR. +3		4 APR. +6		5 MAY +8		6 JUN. +11		7 SOL. +13		8 JUL. −15		9 AUG. −12		10 SEP. −9		11 OCT. −7		12 NOV. −4		13 DEC. −2	
	G. Jan.	I. Jan.	G. Jan.	I. Feb.	G. Feb.	I. Mar.	G. Mar.	I. Apr.	G. Apr.	I. May	G. May	I. Jun.	G. Jun.	I. Sol	G. Jul.	I. Jul.	G. Aug.	I. Aug.	G. Sep.	I. Sep.	G. Oct.	I. Oct.	G. Nov.	I. Nov.	G. Dec.	I. Dec.
Sun.	1	1	29	1	26	1	26	1	23	1	21	1	18	1	16	1	13	1	10	1	8	1	5	1	3	1
Mon.	2	2	30	2	27	2	27	2	24	2	22	2	19	2	17	2	14	2	11	2	9	2	6	2	4	2
Tue.	3	3	31	3	28	3	28	3	25	3	23	3	20	3	18	3	15	3	12	3	10	3	7	3	5	3
Wed.	4	4	Fe1	4	Mr1	4	29	4	26	4	24	4	21	4	19	4	16	4	13	4	11	4	8	4	6	4
Thu.	5	5	2	5	2	5	30	5	27	5	25	5	22	5	20	5	17	5	14	5	12	5	9	5	7	5
Fri.	6	6	3	6	3	6	31	6	28	6	26	6	23	6	21	6	18	6	15	6	13	6	10	6	8	6
Sat.	7	7	4	7	4	7	Ap1	7	29	7	27	7	24	7	22	7	19	7	16	7	14	7	11	7	9	7
							1st Quarter						Whitsun-day													
Sun.	8	8	5	8	5	8	2	8	30	8	28	8	25	8	23	8	20	8	17	8	15	8	12	8	10	8
Mon.	9	9	6	9	6	9	3	9	Ma1	9	29	9	26	9	24	9	21	9	18	9	16	9	13	9	11	9
Tue.	10	10	7	10	7	10	4	10	2	10	30	10	27	10	25	10	22	10	19	10	17	10	14	10	12	10
Wed.	11	11	8	11	8	11	5	11	3	11	31	11	28	11	26	11	23	11	20	11	18	11	15	11	13	11
Thu.	12	12	9	12	9	12	6	12	4	12	Jul	12	29	12	27	12	24	12	21	12	19	12	16	12	14	12
Fri.	13	13	10	13	10	13	7	13	5	13	2	13	30	13	28	13	25	13	22	13	20	13	17	13	15	13
Sat.	14	14	11	14	11	14	8	14	6	14	3	14	Jy1	14	29	14	26	14	23	14	21	14	18	14	16	14
							Easter-day						Half-Year													
Sun.	15	15	12	15	12	15	9	15	7	15	4	15	2	15	30	15	27	15	24	15	22	15	19	15	17	15
Mon.	16	16	13	16	13	16	10	16	8	16	5	16	3	16	31	16	28	16	25	16	23	16	20	16	18	16
Tue.	17	17	14	17	14	17	11	17	9	17	6	17	4	17	Au1	17	29	17	26	17	24	17	21	17	19	17
Wed.	18	18	15	18	15	18	12	18	10	18	7	18	5	18	2	18	30	18	27	18	25	18	22	18	20	18
Thu.	19	19	16	19	16	19	13	19	11	19	8	19	6	19	3	19	31	19	28	19	26	19	23	19	21	19
Fri.	20	20	17	20	17	20	14	20	12	20	9	20	7	20	4	20	Se1	20	29	20	27	20	24	20	22	20
Sat.	21	21	18	21	18	21	15	21	13	21	10	21	8	21	5	21	2	21	30	21	28	21	25	21	23	21
																			3rd Quarter						C Xmas-day Christmas	
Sun.	22	22	19	22	19	22	16	22	14	22	11	22	9	22	6	22	3	22	Oc1	22	29	22	26	22	24	22
Mon.	23	23	20	23	20	23	17	23	15	23	12	23	10	23	7	23	4	23	2	23	30	23	27	23	25 c	23
Tue.	24	24	21	24	21	24	18	24	16	24	13	24	11	24	8	24	5	24	3	24	31	24	28	24	26	24
Wed.	25	25	22	25	22	25	19	25	17	25	14	25	12	25	9	25	6	25	4	25	Nv1	25	29	25	27	25
Thu.	26	26	23	26	23	26	20	26	18	26	15	26	13	26	10	26	7	26	5	26	2	26	30	26	28	26
Fri.	27	27	24	27	24	27	21	27	19	27	16	27	14	27	11	27	8	27	6	27	3	27	De1	27	29	27
Sat.	28	28	25	28	25	28	22	28	20	28	17	28	15	28	12	28	9	28	7	28	4	28	2	28	30	28
																									31	29
																									Year-Day	

*Each year's last day to be YEAR-DAY, dated Dec. 29, as an 8th day in that week. Leap-Day, Feb. 29, to be moved to the BETTER date June 29. The Quarter-Years would end with their 13th weeks on April 7, Sol 14 and Sept. 21, at exactly ¼, ½ and ¾ of their last months; thereby facilitating accounting while giving the many advantages of 28-day months.

venience during the first year after its adoption. There would be difficulty in making comparisons between the months of the new calendar and the corresponding months of the old calendar. An adjustment table, however, such as that illustrated on Chart No. 16 would considerably reduce the time necessary for making these computations. All anniversary dates, birthdays and holidays would be changed but there would be little actual difficulty in determining the new dates from the adjustment table. The legal difficulties due to changes in maturity dates of leases, contracts and mortgages could be easily overcome by appropriate acts of the Legislatures.

It would also be necessary to have a table for converting twelve into thirteen monthly payments. Such a table is not difficult to compile. Comparisons between the first year in which the calendar was changed and the preceding years would be upset, as it may be necessary, for instance, to compare the eighth month of the new calendar with both the seventh and the eighth month of the old calendar. Weekly comparisons would not be upset, but only the monthly comparisons. After the first year, this inconvenience would be overcome.

The inconveniences and difficulties which would be experienced during the first two years of the new calendar are slight when compared with the many advantages which would be obtained in the business, social and religious world by the adoption of the proposed International Fixed Calendar.

The Next Step

The League of Nations has already asked each country to form an association in which people in all walks of life would be represented. It was suggested that in each country a national committee be formed of representatives from organizations such as Chambers of Commerce, Agricultural, Cultural and Press Associations, Labor Unions, Women's, Educational, Transportation, Scientific, Religious and other national organizations. Each one of these organizations could nominate an official delegate to unite in forming the national committee. The governmental departments would also be represented on the national committee. At the first meeting the delegates could be supplied with the documents on the subject. Delegates could be supplied with the necessary number of pamphlets to distribute to the various members of their organization. After the members of each organization had studied the question, the organization would make recommendations to the central committee.

It would then be necessary to call an International Conference under the direction of the League of Nations. At that conference a definite plan, the 12-month or the 13-month plan, should be adopted, the details worked out, and a decision reached regarding the date on which the new calendar should be put into effect. At the same time the question of the fixed Easter could be decided.

After the International Conference had approved the plan, all that would be necessary to put it into effect would be the ratifying legislation in the various countries. Such legislation, which would be of a very simple nature, would take care of the change in dates of holidays, the maturity dates of contracts, and other legal matters.